

NEW ENGLAND NOTE

SAGITTARIA TERES (ALISMATACEAE) IN NEW HAMPSHIRE

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Sagittaria teres S. Watson is a geographically restricted aquatic tracheophyte endemic to the northeastern coastal plain of the United States. It is apparently most closely related to *S. isoetiformis* J. G. Sm., a species of the southeastern coastal plain, with which it shares phyllodial leaves and CAM photosynthesis (Haynes and Hellquist 2001). Plants are typically found on acid, nutrient-poor pond shores, submerged along shallow bottoms or lower shores or emersed, usually later in the season as water volume declines.

The majority of world occurrences of *Sagittaria teres* are in New England (Sorrie 1994). Within this region, it primarily occurs on the coastal plain of Massachusetts and Rhode Island, with disjunct inland populations in the Connecticut River Valley of Massachusetts. *Sagittaria teres* is listed as Division 1 (i.e., globally rare taxa) in “*Flora Conservanda: New England*” (Brumbach and Mehrhoff et al. 1996). It is also provided a global rank of G3 (i.e., less than 100 global occurrences; NatureServe 2002) and is thought to formerly have occurred from New Jersey north to Massachusetts (Haynes and Hellquist 2001). The discovery of a disjunct New Hampshire population expands the known range northward by approximately 75 km from the northernmost population in Massachusetts.

Sagittaria teres was first discovered in New Hampshire in 1991 by the first author while performing a floristic inventory of Lake Massabesic, Manchester, New Hampshire. At that time a flowering specimen was collected (Harvey 434, NHA). Shortly thereafter, the specimen was annotated to *S. subulata* (L.) Buchenau. In 2002, the *Sagittaria* collections at the Hodgdon Herbarium (NHA) were examined as part of the New

England Wild Flower Society's Herbarium Recovery Project, a program aimed at collecting information for New England rare tracheophytes through surveys of regional herbaria. The Lake Massabesic specimen was re-determined as *S. teres* on the basis of pubescent filaments, pedicellate carpellate flowers, and phyllodial leaves with nearly terete cross-section (then somewhat compressed in drying).

The importance of the collection prompted field surveys to re-locate the population. Visits were made on 16 August and 9 September 2002 to the stretch of shoreline along the western lobe of the lake where *Sagittaria teres* was first observed in 1991. The population was found to be extant and to extend over approximately 400 meters of shoreline. Although no flowering plants were found, vegetative plants were identified by white, prominently septate roots and thick, phyllodial leaves with elliptic to nearly terete cross-section. The first plants observed on 16 August 2002 were found detached, either floating or washed up on shore by the waves. Rooted rosettes were completely submerged in 10–100 cm of water.

By the 9 September visit, the lake water level had dropped nearly 20 cm since 16 August, and rooted plants were more visible. The northern half of the population, though largely submersed, consisted of a fair number of emerged individuals occurring on a relatively broad, mucky-silty-sand shelf. Associated plant species in this area included *Juncus militaris* Bigelow, *Eriocaulon aquaticum* (Hill) Druce, *Eleocharis robbinsii* Oakes, *Pontederia cordata* L., *Gratiola aurea* Pursh, *Nymphaea odorata* Aiton, *Sagittaria latifolia* Willd., and *Utricularia cornuta* Michx.

The southern half of the population was mostly submerged in 10–80 cm of water. The shoreline along this section consisted of a relatively narrow shelf of cobble and sand, bordered by a rocky edge and a shrub layer consisting primarily of *Vaccinium corymbosum* L. and *Clethra alnifolia* L. which abruptly transitioned into a mainly mixed pine upland forest. Associated plant species in this area included *Eriocaulon aquaticum*, *Lobelia dortmanna* L., *Juncus militaris*, *Sparganium angustifolium* Michx., and *Sagittaria graminea* Michx.

Lake Massabesic is a relatively shallow lake covering approximately 1008 ha that spans two townships (i.e., Manchester and Auburn) in southeastern New Hampshire. Measurements of pH taken in 2000 ranged from 6.4 to 6.7 (New Hampshire Department of Environmental Services 2001). The lake is impounded in order to supply municipal drinking water for seven towns: Auburn, Bedford, Derry, Goffstown, Hooksett, Londonderry, and Manchester. Of the 107 km² drainage area

of Lake Massabesic, approximately 3226 ha is protected in some fashion (City of Manchester New Hampshire 2003).

Sagittaria teres appears, in the short term, to be secure on Lake Massabesic. However, plants remain largely vegetative, persisting as rosettes of phyllodial leaves under the artificially maintained lake level. This may pose a long-term threat to the population since only emerged plants appear to flower and reproduce sexually (Sorrie 1994). This may have ramifications for lasting genetic variability in this isolated population. Sorrie notes, however, that some populations of this species in deeper ponds rarely flower. Study of genetic variation between sites with different hydrologic regimes may be warranted to understand how *S. teres* copes with altered water levels.

The introduction of *Myriophyllum heterophyllum* Michx., an invasive aquatic plant species, into Lake Massabesic presents a potentially significant threat to aquatic flora of the lake. Though the current population does not immediately threaten the *Sagittaria teres*, elimination efforts have not thus far been effective and prove especially difficult due to the lake's use as a public water supply (New Hampshire Department of Environmental Services 2002).

We are unaware of any previous reports of *Sagittaria teres* in New Hampshire (Fernald 1950; Gleason and Cronquist 1991; Haynes and Hellquist 2001; Seymour 1982). The presence of *S. teres* at Lake Massabesic further emphasizes the recognized affinities of New Hampshire's coastal plain pond shore flora to the greater northeastern coastal plain (Sperduto 2000). While investigating these affinities, Sperduto also documented another disjunct coastal plain pond shore species previously unknown in New Hampshire with the discovery of *Scleria reticularis* Michx. in Litchfield (Sperduto 1996).

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